13. Find the area of a triangle with side lengths 17 m, 14 m, and 16 m. Round your answer to the nearest integer.

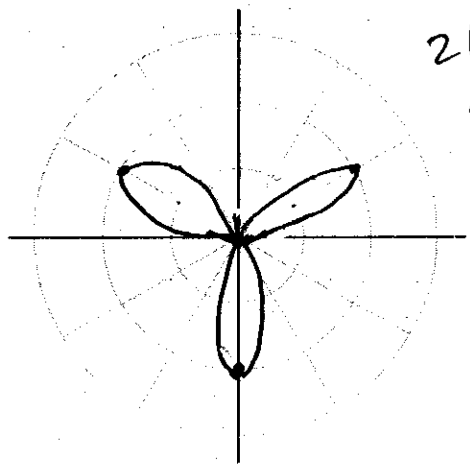
$A = \sqrt{s(s-a)(s-b)(s-c)}$

$s = \frac{17+14+16}{2} = \frac{47}{2} = 23.5$

$A = \sqrt{23.5(23.5-17)(23.5-14)(23.5-16)}$

$A = \sqrt{23.5(6.5)(9.5)(7.5)} \approx \boxed{104\ m^2}$

14. Graph the polar equation $r = 2\sin(3\theta)$. Label at least four exact (r,θ) points on the graph.



$2\left(\sin\frac{3\pi}{4}\right)$

$2 \cdot \frac{\sqrt{2}}{2} = \sqrt{2}$

θ	r
0	0
$\pi/4$	$\sqrt{2}$
$\pi/2$	$2\left(\sin\frac{3\pi}{2}\right) = 2(-1) = -2$
$\pi/6$	2
$5\pi/6$	2

$(0,0)\ (\sqrt{2}, \pi/4)$

$(-2, \pi/2)$

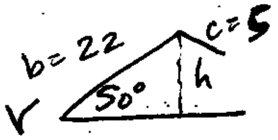
15. Multiply $2(\cos(12°) + i\sin(12°)) \cdot 5(\cos(15°) + i\sin(15°))$. Give the answer in the form $a + bi$. Round a and b to 3 decimal places.

$2 \cdot 5\ (\cos(12° + 15°) + i\sin(12° + 15°))$

$10(\cos 27° + i\sin 27°) = \boxed{8.910 + 4.540i}$

16. Solve for the remaining side and angles of the triangle, if possible. Assume (α, a), (β, b), and (γ, c) are angle-side opposite pairs. Round your answers to the nearest tenth.

$$b = 22,\ c = 5,\ \gamma = 50^\circ$$



$h = 22 \cdot \sin 50^\circ = 16.8$

$c = 5 \rightarrow$ too short   so no triangle possible

$c < h$

$5 < 16.8$

17. Find all of the cube roots of 2. Write your answers in the form $r(\cos\theta + i\sin\theta)$.

$n = 3 \quad r = 2 \quad r^{1/n} = 2^{1/3} = \sqrt[3]{2} \quad \theta = \frac{0^\circ}{3} \quad \frac{360^\circ}{3} = 120^\circ$

$z_1 = \sqrt[3]{2}(\cos 0^\circ + \sin 0^\circ)$

$z_2 = \sqrt[3]{2}(\cos 120^\circ + i\sin 120^\circ)$

$z_3 = \sqrt[3]{2}(\cos 240^\circ + i\sin 240^\circ)$

18. Write a set of parametric equations for the oriented line segment starting at $(3,-5)$ when $t = 0$ and ending at $(-2,2)$ when $t = 1$.

$X = m_1 t + b_1$ $Y = m_2 t + b_2$

$3 = m_1(0) + b_1$ $-5 = m_2(0) + b_2$

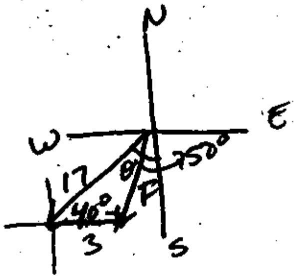
$3 = b_1$ $-5 = b_2$

$-2 = m_1(1) + 3$ $2 = m_2(1) + -5$

$-5 = m_1$ $7 = m_2$

$$\boxed{\begin{aligned} X &= -5t + 3 \\ Y &= 7t - 5 \\ 0 &\le t \le 1 \end{aligned}}$$

19. A small boat leaves a dock at Lake Powell with a speed of 17 miles per hour with respect to the water at a bearing of S50°W. The water is flowing due east at 3 miles per hour due to the wind. What is the boat's true speed and heading? Round your answers to the nearest tenth.



$\vec{F}^2 = 17^2 + 3^2 - 2(17)(3)\cos 40°$

$\vec{F}^2 = 219.863$

$\vec{F} = \sqrt{219.863} \simeq 14.8$ mph

$\boxed{\text{Speed: } 14.8 \text{ mph. heading: } 222.5° \text{ (from the North)}}$

$\frac{\sin 40°}{14.83} = \frac{\sin\theta}{3}$

$180° + 42.53° = 222.53°$

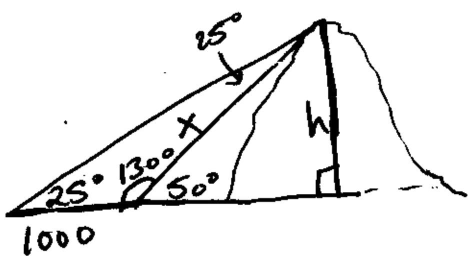
$\theta = \sin^{-1}\left(\frac{3\sin 40°}{14.83}\right) \simeq 7.47°$

$50° - 7.47° = 42.53°$

20. Find the exact value of $\tan(15°)$.

$\tan 15° = \tan\left(\frac{30°}{2}\right) = \frac{\sin 30°}{1+\cos 30°} = \frac{\frac{1}{2}}{1+\frac{\sqrt{3}}{2}} = \frac{\frac{1}{2}}{\frac{2+\sqrt{3}}{2}} = \boxed{\frac{1}{2+\sqrt{3}}}$

21. In order to determine the height of a hill, two sightings from the horizontal ground, one 1,000 feet directly behind the other, are made. If the angles of inclination were 50° and 25°, respectively, how tall is the hill to the nearest foot?



$\frac{\sin 25°}{1000} = \frac{\sin 25°}{x}$

$x = 1000$

$\sin 50° = \frac{h}{1000}$

$1000 \cdot \sin 50° = h$

$766 = h$

$\boxed{766 \text{ ft}}$

Salt Lake Community College
Math 1060 Final
Spring 2015

Part I – No Calculator

1. Find the exact value of each of the following or state that it is undefined.

   a) $\sin\left(\frac{3\pi}{4}\right)$ $= \frac{\sqrt{2}}{2}$

   b) $\sec\left(-\frac{5\pi}{6}\right)$ $= \frac{-2}{\sqrt{3}} = \frac{-2\sqrt{3}}{3}$

   c) $\csc(720°)$ = undefined

   d) $\tan(150°)$ $= \frac{-1}{\sqrt{3}} = \frac{-\sqrt{3}}{3}$

2. Use appropriate identities to find the exact value of $\sin\left(\frac{5}{12}\pi\right)$.

$$\frac{2\pi}{12} + \frac{\cancel{3}\pi}{12}$$

$$\frac{\pi}{6} + \frac{\pi}{4}$$

$$\sin\left(\frac{\pi}{6}+\frac{\pi}{4}\right) = \sin\left(\frac{\pi}{6}\right)\left(\cos\frac{\pi}{4}\right) + \left(\sin\frac{\pi}{4}\right)\left(\cos\frac{\pi}{6}\right)$$

$$= \left(\frac{1}{2}\right)\left(\frac{\sqrt{2}}{2}\right) + \left(\frac{\sqrt{2}}{2}\right)\left(\frac{\sqrt{3}}{2}\right)$$

$$= \boxed{\frac{\sqrt{2}+\sqrt{6}}{4}}$$